

## EDITORIAL ARTICLES.

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### SURGICAL TREATMENT OF MALIGNANT TUMORS OF THE FAUCES.

Castex contributes to the *Revue de Chirurgie* a series of articles on this subject which amounts to an elaborate treatise of such value as to merit an extended review. Professional opinion has undergone a marked change regarding the surgery of this perilous region within a few years, and doubtless, as the experience of operators increases and the practicability of extirpation of the neoplasms of the fauces becomes generally accepted, many lives will be saved. or, at least, considerably prolonged, which now are lost through the ignorance and timidity of surgeons. Blandin condemned the stupid rashness of any attempt at removal of the malignant tonsil, and a few years later invented a procedure for this very purpose. Many surgeons have essayed the operation, and Castex has, within two years, collected reports of thirty-five cases of the disease, eleven of which were under his own observation. His opportunities have been large, and his study of the literature of the subject thorough.

The beginning of these growths is generally insidious, and the physician is quite likely to prescribe chlorate of potassium; the patient is fortunate if he escapes cauterization with nitrate of silver.

Curiously the difficulty and pain in swallowing disappear in many cases and the patient forgets his trouble, until four or five months afterward, he notices a swollen gland at the angle of the jaw, and the case may have progressed beyond the point of justifiable operation.

All the parts of the fauces do not display an equal tendency to the development of malignant tumors. The tonsil is the point of least resistance in this respect. Of thirty-one cases in which the starting-point was observed, in twenty-one the tonsil was the part invaded first. Involvement of both tonsils is very rare. When the case is not seen

early, the tonsil is usually found to be more extensively destroyed than any other part. Next to the tonsil the anterior pillar is most susceptible to attack.

Necropsies are rarely made, and very few histological observations have been recorded. Castex has made a particular study of the normal anatomy of the parts. The tonsil is very nearly opposite the angle of the jaw. He regards it as an agglomerate gland, and calls attention to the fact that there are miniature tonsils in the faucial depression, which satellites are probably the seat of the nodular growths around the principal tumor. Luschka discovered the pharyngeal tonsil in 1856; Gerlach has recently found a similar structure around the orifice of the Eustachian tube. There is also a series of isolated glands behind the circumvallate papillæ of the tongue, connecting the two principal tonsils, and meriting the name of the lingual tonsil. Between these various glands there is lymphoid tissue, but no distinct eminence of it, and on the inferior and middle turbinated bones and the posterior wall of the pharynx there are islets of the same, which are comparable to Peyer's patches. Thus is formed what Waldeyer has designated the lymphatic ring of the throat. The lymphatic vessels of the tonsils are numerous and large, and, according to Cruveilhier, empty into the glands at the angle of the jaw.

The malignant tumors of this region vary in character. Most authors consider encephaloid as the most common, obviously because they include under this head all tumors which have a cerebriiform appearance, such as lymphadenomata and lymphosarcomata. Unfortunately microscopic examinations have been so infrequently made that it is impossible to state positively the relative frequency of the different varieties. In the observation of Castex, epitheliomata are by far the most frequent.

Heredity is believed to have little, if any, influence on the development of these growths. They have been seen in persons of various ages from 7 to 82 years. Epithelioma and carcinoma are more frequent in adults, sarcoma in the young. But a small proportion of the victims are females. The alleged influence of tobacco-smoking may well be doubted. The coincidence of buccal epithelioma and diabetes has been noticed.

These tumors manifest themselves by various symptoms. In the throat there may be abnormal sensations—distress in swallowing solids, especially in the second stage of deglutition; in some cases there is no pain, but a distressing dryness; in others there is excessive formation of saliva. Pain is not often excited by swallowing saliva, but is caused by pressure at the angle of the jaw. Frequently there is less pain after the surface of the tumor has been removed by ulceration. Meantime pulsating or lancinating pains occur in the head, neck and face, and especially in the ear. The aural pain, occurring in different diseases, often diverts the attention of the physician from the throat. The voice is altered, the degree of change depending on the size of the tonsil, the amount of salivary secretion, and the involvement of the veil. One of the saddest complications is the ptyalism, which at first is an inconvenience only after eating, but later is constant and may be prodigious, seriously impairing speech. Difficulty in swallowing is marked, and, unless care is exercised, liquids may be ejected from the nose. As some patients have no pain during deglutition though great trouble in the performance, Castex proposes the word *odynophagia* to designate painful swallowing, as distinguished from dysphagia or difficult swallowing. Hæmorrhages are infrequent, at least before the last stages, and are commonly insignificant. The breath is rarely fetid, except in the advanced condition of the disease.

Great care is necessary in the examination of the fauces and neighboring parts of the pharynx. (Would that we had an English word exactly corresponding with the French *arrière bouche*)! Natural light is the best. When the patient opens his mouth, he should be asked to show his teeth so that the lips may be fully separated. The left forefinger should then press back the right labial commissure in order to expose the throat to oblique illumination, thus permitting the examiner to place himself in front without intercepting the light. Frequent observations are desirable. Depression of the tongue is sometimes impossible, because its vertical portion has already become hardened, and sometimes because it is exquisitely tender.

The tonsil may be greatly enlarged. It is sometimes cracked, and then it is difficult to distinguish the disease from syphilis. It may be

lobulated or it may have disappeared by ulceration. If the tumor has invaded the surrounding parts, it is elevated as it hardens, and leaves the tonsil in a pit. The anterior pillar becomes thick, short, shriveled and hard. Then the tongue and the veil of the palate are invaded.

Having acquired a certain volume, the neoplasm begins to break down. It resembles a mush-room, its borders spreading out under the veil, the pedicle being concealed. It often becomes lobulated, owing probably to the movements of the tongue, and assumes a grayish hue. The ulceration looks like that in cancer of the tongue; there is rarely a granulated surface; the edges are red; the sore is covered with a gray, pulpy glaze, which gets onto the teeth and tongue. The disease is not entirely confined to the principal tumor. Around it at various points may appear spots of the same character, though separated by areas of seemingly healthy tissue, which, however, are soon involved and become part of the main cancerous mass, and others come into view outside the increased limits.

It is very important to examine every part with the pulp of the finger. Pain is produced by the digital touch, but all the region has lost its reflex sensibility, and occasionally is analgesic, as if it had been treated with cocaine. It is difficult to ascertain the degree of density of growths on the veil on account of its motion.

The most common seat of lymphatic involvement is at the angle of the jaw. The discovery of a hard gland at this spot should lead immediately to an examination of the fauces. These glands only exceptionally suppurate. Sometimes nodules are found in the submaxillary region; they are hard, movable and painful. At this time excision offers a chance of success. Gradually almost all the other lymphatics in the neighborhood are invaded.

The general health may not be affected for a long time, but some patients decline rapidly, because they deny themselves food in order to avoid odynophagia.

The progress is usually steady, but there are periods of arrest, especially between the appearance of the tumor at the angle of the jaw and the enlargement of the cervical glands. The veil is particularly liable to involvement, and the disease extends from it down the an-

terior pillar and involves the tongue. The posterior nares and the larynx are rarely affected. After a long time the hypertrophied glands may become sarcomatous. The dangerous period begins when the gland capsule breaks down; then removal is imperatively demanded. The duration of the disease is extremely variable. It may be five years or only a few months, according to the nature of the tumor and the constitution of the individual. The mode of death is equally uncertain. Hæmorrhage quite often ends the scene, coming from the branches of the external carotid. The internal carotid is not as near the tonsil as certain unfortunate accidents of tonsillotomy suggest; it is two centimetres from the outer surface of the gland.

In making a diagnosis, we should be suspicious of unilateral hypertrophies of the tonsil in mature patients, especially as atrophy is the rule at this time of life. Pain and soreness in the throat should never be disregarded. Infecting chancre, which Diday considers not rare on the tonsil and soft palate, may be recognized by its subacute progress, the pre-auricular adenitis, its singleness, its regular, oval or circular form, the evenness of its bottom and edges, its occurrence in young women, and its rapid cicatrization. The diagnosis is far less easy in some of the secondary manifestations of syphilis. Mucous patches especially are liable to be mistaken for epithelioma. In a general way, when the ulcer has a grayish bottom, is indolent, and is not accompanied by lymphatic enlargement syphilis is to be suspected. Tuberculosis of the pharynx is distinguished by absence of induration and of large lymphatic tumors. Tuberculous ulcers generally do not bleed, and the surface is granulated, as that of cancer is not. Scrofulides display irregular, granulating plates with cicatricial points, or an uneven, serpentine ulceration, or several small, jagged ulcers, eating beneath the surface; marks of scrofula will be present elsewhere. The microscope does not furnish means for perfect diagnosis between simple and malignant hypertrophies of the tonsil.

Epithelioma is characterized by early ulceration on an indurated base, and by the slowness of its extension and of its involvement of lymphatic glands. Lymphadenoma and lymphosarcoma are cerebriform, of large volume, quickly adhere to the vessels, grayish, and but slightly tender. True carcinoma is very rare.

When the growth is circumscribed, the lymphatics are not involved, and the general condition is good, all surgeons are agreed that the tumor should be removed; but when the disease has invaded the walls of the pharynx and the neighboring glands, there is room for a question as to the propriety of an operation. Each case must be treated on its own merits, as in mammary cancer. If the tonsil and a part of the soft palate are involved, ablation is called for, especially if the growth has been slow. Operation is permissible even if the lymph-glands at the maxillary angle are implicated, provided they are movable. But when their mobility is lost, when the lymphatics in the carotid and subclavian triangles are affected, operation is contraindicated, because it only hastens the growth of the tumor. Cachexia and rapid growth absolutely prohibit the use of the knife. Even if the surgical procedure does not cure where it is permissible, it relieves the pitiful condition of the patient, saving him the pain in the ear, odynophagia, hæmorrhage, dyspnoea, and the swallowing of putrid discharges from the ulcer.

Many different methods of operating have been tried. Chloroformization is often difficult on account of the tendency to suffocation. Preliminary tracheotomy expedites the process and saves much trouble, closing the windpipe against the entrance of blood, especially when the instrument of Trendelenburg is used. Antecedent ligation of the carotid is considered indispensable by Polaillon, as it greatly lessens hæmorrhage, and sometimes diminishes pain.

In the removal of the tumor, there have been used the *ecraseur*, thermo-cautery, galvano-cautery, and cutting instruments, but the last two are best. When the growth is not very large, is movable, and the glands are not involved, the operation should be done through the mouth. The knife can be used. LeFort removed a cancer which involved the tonsil and part of the base of the tongue by passing curved needles under the tumor and applying the loop of a galvano-cautery beneath them. Ordinary means will control the bleeding. There is not much danger of wounding the internal carotid. When the operation can not be performed through the mouth, an artificial opening must be made. Jæger practised incision of the cheek on the affected

side in direct continuation of the line of the mouth. Polaillon ligated the external carotid, and then joined the upper end of this incision to the angle of the mouth by a horizontal cut, making a flap which he turned downward and forward towards the hyoid. With the chain saw he divided the lower maxillary at the right of the symphysis and across the body of the ramus. This portion of bone being raised, he could reach the tumor. He passed a platinum wire through the tongue from a little above the great horn of the hyoid to the apex of the lingual V; a second loop was placed below the tonsil from the base of the tongue to the pharynx; and a third behind the tonsil cut the wall of the pharynx. The tumor was removed; the hæmorrhage was great; the cheek was sutured; no drain was used. One carbolized sponge was placed inside, and one outside, fastened together by a thread passing through the wound; the inner one was taken out the next day. The wound healed admirably, and the patient left in twenty days, able to swallow liquids and semi-solids perfectly. Polaillon has also practiced a semi-circular incision over the posterior and lower borders of the lower jaw-bone, to circumscribe the tonsillary fossa. A modification of this consists of two horizontal incisions united by a vertical which follows the parotid border of the jaw. Cheever extirpated the tonsil. He made a horizontal incision on the lower edge of the jaw, cut the bone in front of the masseter, drew out the tonsil with his finger, all without hurting a nerve or important vessel, then sutured the pieces of bone, and left an opening for discharge. In another case, he carried his incision from the end of this first along the anterior border of the sterno-mastoid. The incision along the base of the jaw allows one to pass under the parotid, between the submaxillary and the carotid vessels. Maunoury, in a case of epithelioma of the veil, anterior pillar and back part of the gum, made a vertical incision from the corner of mouth down to the lower edge of the jaw, and a horizontal cut to its angle. Israel, in a case of epithelioma of the third part of the pharynx, which was attached to the back of the pharynx, made a preliminary tracheotomy, and, three days afterwards, made an incision from the base of the jaw, two fingers' breadth in front of the angle, to the upper part of the trachea. The larynx was turned around on its axis, and

made to present its posterior face, which was then freed from the tumor. Death occurred in seven days from gangrenous retro-laryngeal abscess. Billroth performs pharyngotomy by a cut along the anterior border of the sterno-mastoid. Blandin and Dumarquay, when the tumor is too large to be removed through the mouth, open in at the same point, an assistant drawing back the important vessels. Duplay recommends Malgaigne's subhyoid pharyngotomy, in which an incision five centimeters long is made along the lower border of the hyoid, thus escaping the superior laryngeal vessels and nerves.

The following examples of large operations are given because they were brilliantly successful. In 1882 Labbé reported a case of epithelioma of tonsil, veil, neighboring pharynx, part of tongue and floor of mouth. He made a preliminary resection of the inferior maxillary, and totally ablated the growth with the thermo-cautery. Two objections may be raised to this mode of proceeding: (1) the absorption of septic products which form on the eschars, which, however, may be remedied by frequent antiseptic washing and leaving an aperture to the outside for a drainage tube; (2) the difficulty of alimentation, which Labbe overcame with the tube of Faucher. In 1884, Navaro, Turin, removed from a female, æt. 45, the lower part of the pharynx and upper part of the gullet. Five months afterwards she could take solid food, was in good condition, and the disease had not returned. One of the most extensive operations attended with good results was made in 1879 by Caselli, of Genes, on a girl æt. 19, who had epithelioma of pharynx, uvula, tonsils, base of tongue and part of larynx. There was no lymphatic enlargement, and the general condition was good. Preliminary tracheotomy was practised with the galvano-cautery and the tube of Trendelenburg was inserted. The incision extended from the symphysis to the sternum. The larynx and pharynx were detached at the level of the cricoid cartilage, the hyoid was cut in the middle, the base of the tongue was extirpated, the pharynx entered, all the soft palate detached, the pharynx amputated above, and the tonsils removed. An œsophageal tube was inserted, and three-quarters of the wound closed. Less than two ounces of blood was lost. The operation lasted over three hours. The points of chief difficulty



were the isolation of the larynx, so as not to injure the carotids and vagi, and the extirpation of the tonsils. Union was complete in one month, and in another the patient could swallow solids and liquids.

These operations are merely palliative, but in such tumors as sarcomata they prolong life and make it fairly comfortable. When the recurrence takes place, the patient suffers less than at first, because the parts invaded are less sensitive than the mucous parts at first attacked, and the tumor no longer presents retracted or bulging surfaces for the bolus of food to irritate. If the disease returns in the glands, the pain is less acute. Cachexia reduces the painful excitement of the nervous system. As Gosselin says, it is better to substitute a wound which the patient sees healing, than to allow him to observe constantly a growing disease. It is easier, also, to deceive the patient about the return of the disease, than about the character of the disease at first. If death by hæmorrhage threatens, the ligation of the common carotid, after Weiss, should be practised.

As regards medication, syphilitic treatment should be given in doubtful cases. Arsenic is employed by Verneuil and Bourdon, but is principally useful through its moral effect. Applications of cocaine are serviceable.

Castex sums up as follows :

Malignant tumors of the tonsillar region are most frequently epitheliomatous, and the tonsil is their usual point of departure. They generally attack adults rather than children. The chief functional symptoms are ear-pain, salivation, dysphagia and odynophagia. The objective characteristics are tendency of the ulceration to spread rather than to go deeply, grayish and pulpy deposit covering the ulcer; crushed forms or scattered spots sometimes covering the growth; anæsthesia to touch; angular glandular enlargement. The general symptoms appear late. The progress is not steady. Some epitheliomata bore through the base of the skull. Adenomata of the veil, at first encapsulated, may break out and become sarcomata. Early diagnosis is very important, and in elderly people unilateral tonsillar hypertrophy is suspicious. The principal disease with which it

liable to be confounded is syphilis, especially chancre of the tonsil.

The rules for surgical interference are (1) when the neoplasm is circumscribed, and the lymphatics are not involved, operate; (2) when the tumor, more extended, but still circumscribed and movable, is accompanied by secondary lymphatic disease, operation is justifiable, intervention being useful more generally than harmful; (3) when the involvement is greater, interference, though only palliative, is permissible, if certain conditions obtain, intolerable pain, intention of suicide, etc. The operation has a preliminary and a fundamental stage. It may be done through the natural or artificial passages. An opening for drainage should always be provided. Generally if the operation is early and thorough, the prolongation of life is satisfactory.

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#### EXCISION OF THE LARYNX.

*Le Progres Medical* of March 27 and April 10 of the present year, contains an exhaustive memoir by M. Baratoux, on the subject of "Excision of the Larynx." This may be considered as supplementing the contribution on this subject by Hahn (see *ANNALS OF SURGERY*, Vol. III., No. 1., P. 67, January, 1886) and should be studied in connection with it. Hahn published a list of ninety-one cases, together with eleven hitherto unpublished cases of his own. Baratoux has assembled 104 cases for the purpose of his study. The contributions of Gerster, Park and Lange, in the number of the *ANNALS OF SURGERY*, above referred to, should also be considered in this connection.

The substance of Baratoux's memoir is as follows:

*History.*—Until Levret, tumours of the larynx were left to nature. Desault was the first to propose the removal of laryngeal neoplasms; he described laryngotomy, but never practiced it. The first attempt of the kind was made by Bratlers, of Louvain, in 1833, and since that time the operation has been many times repeated. In 1829, Albers, of Bonn, in experimenting to establish at what point the larynx participated in respiration, removed a part, and even the whole of the larynx of dogs; but his two experiments were not encouraging, for one

of the animals died of hæmorrhage during the operation, and the other sank from inanition nine days afterwards. In 1854, Langenbeck having been consulted by a patient with malignant tumour of the larynx, discussed in one of his clinical lectures, the operative procedure of extirpation of the larynx, but the invalid refused the operation. Later Koeberle stated that he would not hesitate to excise the vocal organ in a case of cancer, "because," said he, "it would be more serviceable to have recourse to the operation, rather than not to intervene at all." Hueter also attributes to himself priority in the operation, which he intended to employ in the case of a woman with cancer of the arytenoid mucous membrane. He was going to do a preliminary tracheotomy, when the patient died. In 1866, Patrick Heron Watson, of Edinburgh, having to treat a patient with tertiary syphilis, and destruction of the laryngeal cavity, determined to excise the larynx. The patient died of pneumonia three weeks after the removal of his vocal organ.

Ignorant of this attempt, Czerny, of Heidelberg, wished to assure himself that removal of the larynx did not imperil the life of animals. His first experiments were not fortunate, for one of his dogs died at the end of two days, two others after fifteen days, and the last at the end of the fourth week from asphyxia due to displacement of the canula. In a later experiment, Czerny performed a preliminary tracheotomy, and when the trachea had become adherent to the skin, he did the excision. Making use of canulæ of larger calibre, he had nothing more to fear from displacement of the tube, which had been the cause of his first failures. Czerny's method of operating is the following: The animal being anæsthetized, he incises the skin in the median line from the hyoid bone to the tracheal fistula; then with a blunt instrument he detaches the soft parts; he only uses the bistoury to divide the thyro-hyoid and sterno-thyroid muscles at their insertion to the thyroid. He then cuts the trachea below the cricoid, and introduces into it a smooth caoutchouc tube with thick walls, in order to hinder the entrance of blood, and also to allow of the continuance of the anæsthetic inhalation. By drawing up the larynx he separates it from the œsophagus in order to dissect its posterior surface as far as the point

of the arytenoids; cuts the large cornua of the hyoid bone, and divides the larynx parallel to the upper border of the thyroid. In his five operations, Czerny left the epiglottis in place with the aid of a suture. In his other experiments he removed it, and from the following day the dog could easily swallow food. This operator does not doubt that the excision may succeed in the case of man—provided the patient be nourished by means of an œsophageal tube for a few days. Later speech can be restored by employing an artificial larynx, permitting the air to pass through the mouth and nose. In putting this last idea in practice in dogs, Czerny proved that he could thus re-establish the function of the vocal organ. A short time afterwards, on the 31st of December, 1873, thanks to Billroth, of Vienna, excision of the larynx was admitted to surgical practice. The following table gives a résumé of the excisions which have been performed since the first operation.

Up to the present time there have been 102 excisions—73 for cancers or epitheliomas, 10 for sarcomas, 10 for stenosis, necrosis, polypus, and 9 for affections, the nature of which we do not know—probably, however, epitheliomatous or sarcomatous tumours. Of these nine the operative procedure and results are not given in 5 cases. There remain, therefore, 97 cases which we may analyze. The excision was total in 83, and partial in 14.

The total excisions were :

		CURES.	DEATHS.	RESULT UNKNOWN.
For epitheliomas or cancers,	69	21	47	1
sarcomas, - - -	9	2	7	0
contractions, necrosis, etc.,	4	1	3	0
diseases unknown, -	1	0	1	0
Total, . . . .	83	24	58	1

In these statistics we include as cured 5 cancerous cases of which the results were reported less than two months after operation, and two of them were only operated on quite recently.

TABLE OF EXCISIONS OF THE LARYNX.

No.	Operator.	Date.	Age.	Sex.	Disease.	Parts Removed.	Result.	Remarks.
1	Watson, Edinburgh.	1886.	36.	M.	Syphilitic stenosis.	Larynx and opening of trachea.	Deaths in 3 weeks from pneumonia.	Pneumonia was already suspected before the operation.
2	Billroth, Vienna.	Dec. 31, 1873.	36.	M.	Carcinoma.	Larynx, inferior one-third of epiglottis and two rings of trachea.	Four months after recovery; death in 7 months.	Recurrence.
3	Heine, Prague.	1874.	35.	M.	Syph. strict.	Excision of part and one-half of thyroid.	Death eleven months after.	Progress of the disease.
4	Heine.	April 28, 1874.	50.	M.	Epithel.	Total extirpation.	Death six months after.	
5	Maas, Breslau.	June 2, 1874.	57.	M.	Aden. fibr. carcin.	Total extirpation.	Death, fourteenth day.	Recurrence.
6	Schmidt, Frankfurt.	August 12.	56.	M.	Epithel.	Total extirpation.	Death, fourth day.	Pneumonia.
7	Watson.	1874.	60.	M.	Epithel of left cord.	Total extirpation.	Death, two weeks after.	Collapse.
8	Billroth.	November 11.	54.	M.	Carcinoma.	Total extirpation.	Death four days after.	Pneumonia.
9	Schäbhorn, KSnigsberg.	Jan. 22, 1875.	72.	M.	Carcinoma.	Total extirpation.	Death four days after.	Bronch. pneumonia.
10	Botini, Turin.	Feb. 6, 1875.	24.	M.	Sarcoma.	Total extirpation.	Cured, 1881.	Bronch. pneumonia and ganglion of lung.

11	Largenbeck, Berlin.	July 21.	57.	M.	Carcinoma, larynx and os hyoid.	Larynx, hyoid, parts of pharynx, œsoph., and of tongue.	Death Nov. 23.	Recurrence.
12	Mutanowski, St. Petersburg.	July 27.	59.	M.	Carcinoma.	Total extirpation.	Death three months after.	Pneumonia.
13	Mutanowski, St. Petersburg.	August 9.	47.	M.	Carcinoma.	Total extirpation.	Death two months after.	Recurrence.
14	Maas.	Feb. 5, 1876.	50.	M.	Epithel.	Larynx, excluding epiglottis and loss of cricoid.	Death six months after.	Recurrence 3 months after operation. Death from hæmorrhage.
15	Gerdes, Jewr.	March 30, '76.	76	M.	Carcinoma.	Total extirpation.	Death four days after.	Exhaustion.
16	Reyher, Dorpat.	May.	60	M.	Carcinoma.	Total extirpation, excluding epiglott.	Death eleven days after.	Pneumonia.
17	Watson.	1876.	60	F.	Epith. larynx and glands.	Larynx and glands.	Death one week after.	Pulm. embolism.
18	Kosinski, Varsovie.	March 15, 1877.	36	F.	Epithel.	Total extirp.	Death nine months after.	Recurrence.
19	Bortini.	Aug. 29.	48	M.	Epithel.	Total extirp.	Death three days after.	Pneumonia.
20	Foules, Glasgow.	Sept. 10.	28	M.	Sarcoma.	Lar. exc. great horns of thyroid and half of arytenoids.	Death March 1, 1879.	Pulm. phthisis.
21	Wegner, Berlin.	Sept. 17.	52	F.	Carcinoma.	Larynx, exc. half of cricoid.	Cured Apr. 12, 1878.	

TABLE. Continued.

No.	Operator.	Date.	Age.	Sex.	Disease.	Parts Removed.	Result.	Remarks.
22	Fouls.	Jan. 29, 1898.	59	M.	Stenosis in a dia- betes.	Ant. part of cricoid.	Death two months af- ter.	Slough of leg.
23	Bruns, Tbingen.	Jan. 29.	54	M.	Epithel.	Extirpation.	Death nine months af- ter.	Recurrence.
24	Bunce, Yeo, and Lister.	March.			Papilloma.	Remov. of voc. cord.	Cured.	
25	Rubo, Madrid.	May.	41	M.	Perichondritis and necrosis of thy- roid.	Total extirpation.	Death five days after.	Marasmus.
26	Fouls.	May 30.	60.	M.	Stenosis.	Anterior part of cricoid.	Death two and one- half months after.	Exhaustion.
27	Billroth.	July 7.	50.	M.	Epith. of left cord.	Half the larynx.	Death two years after.	Recurrence (6 months).
28	Czerny.	August 24.	46.	M.	Sarcoma.	Total extirpation.	Death Nov. 30, 1899.	Recurrence.
29	Billroth.	Feb. 27, 1899.	43.	F.	Epith. of pharynx and larynx.	Total extirpation of larynx and half of pharynx and oesophagus.	Death seventh week.	Passage of tube into medi- astinum.
30	Gussenbauer, Prague.	May 24.	24.	M.	Carcinoma.	Total extirpation.	Death two weeks after.	Pulmonary tuberculosis.
31	Macewen, Glas-	July 31.	56.	M.	Carcinoma of phar-	Extirpation of diseased	Death in three days.	Pneumonia.

gov.	Sept. 20.	19.	F.	ynx and larynx.	parts.	Extirpation of diseased parts.	Cured (1884).	Length of operation three and one-fourth hours; galvano-cautery.
32 Cav. Azio Castelli, Reggio-Emilia.				Sarcoma of pharynx, larynx, palate and base of tongue.	Total extirpation.	Death seven months after.	Recurrence.	
33 F. Lange, New York.	Oct. 12.	74.	M.	Sarcoma pharynx and larynx.	Total extirpation.	Death in five days.	Pneumonia.	
34 Mullanowski.	Dec. 4.	60.	M.	Carcinoma.	Part of larynx.	Death in three days.	Collapse.	
35 Langenbeck.	1879.	78.	M.	Carcinoma.	Total extirpation.	Death in seven days.	Broncho-pneumonia.	
36 Carl Reyher, St. Petersburg.	Feb. 26, 1880.	36.	M.	Carcinoma.	Larynx and two rings of trachea.	Cured eighteen months after.		
37 Thiersch, Leipzig.	March 5.	50.	M.	Sarcoma of pharynx, larynx and base of tongue.	Extirp. of diseased parts, part tonsil and one-half of hyoid.	Death March 9, 1881.	Pleurisy.	
38 Alpad Gerster, New York.	March 9.	57.	M.	Carcinoma.	Half of larynx.	Cured fourteen months after.		
39 C. Reyher.	April 1, 1880.	20.	M.	Contract. typhoid fever.	Partial extirpation.	Cured six weeks after.		
40 Thiersch.	April 15.	52.	M.	Carcinoma.	Total extirpation.	Cured seventeen months after.		



TABLE. Continued.

No.	Operator.	Date.	Age.	Sex.	Disease.	Part Removed.	Result.	Remarks.
42	Novaro, Turin.	August 19.	63.	M.	Epithel.	Total extirpation.	Death.	Recurrence third month.
43	Czerny.	Oct. 11.	47.	M.	Epithel.	Total extirpation.	Death March 25, '81.	Recurrence.
44	Hahn, Berlin.	Oct. 23.	67.	M.	Carcinoma.	Larynx, and part of thyroid.	Cured April, 1884.	
45	Caselli.	Nov. 9.	27.	M.	Enchondroma of neck.	Tumor and part of thyroid.	Death in two days.	
46	Thiersch.	Nov. 10.	45.	F.	Carcinoma of pharynx and larynx.	Larynx and part of pharynx.	Death March 16, '81.	Recurrence.
47	Bircher, Aarau.	Dec. 3.	49.	F.	Carcinoma.	Extirpation of gland; recurrence six months after; extirpation of larynx.	Death sixteen days after.	Pneumonia.
48	Pick, London.	Jan. 16, '81.	39.	M.	Epithel.	Total extirpation.	Death in five days.	Pleurisy and pericarditis.
49	Thiersch.	Jan. 17.	57.	F.	Carcinoma of pharynx and larynx.	Larynx and pharynx.	Death in seven days.	Pneumonia.
50	Toro, Cadiz.	March 9.	?	?	Epithel.	Total extirpation.	Death in four days.	Pulmonary emphysema.
51	Winthwerter, Liège.	April 19.	55.	F.	Carcinoma.	Total extirpation.	Cured eleven months after.	

52	Foulis.	April 30.	50.	M.	Epithel.	Total extirpation.	Cured August, '81.	
53	Czerny.	May 12.	47.	M.	Epithel.	Larynx and two rings of trachea.	Cured April, '82.	
54	C. Reyher.	May 14.	57.	M.	Carcinoma.	Total extirpation.	Death in five days.	Broncho-pneumonia.
55	Kocher, Berlin.	May 16.	59.	M.	Carcinoma.	Larynx and ext. part of cricoid.	Cured sixteen months after.	
56	Tilanus, Amsterdam.	May, '81.	51.	M.	Epithel.	Total extirpation.	Death in thirty-six hours.	Collapse.
57	Gustenbauer, Prague.	May 19.	48.	M.	Carcinoma.	Total extirpation.	Cured two years after.	
58	Völker, Brunswick.	May 28.	44.	F.	Epithel.	Total extirpation.	Death five months after.	Suffocation in withdrawing canula.
59	Albert, Vienna.	July 6.	45.	M.	Carcinoma.	Total extirpation.	Death in ten days.	Broncho-pneumonia.
60	Hahn.	August 13.	43.	M.	Carcinoma.	Total extirpation.	Death in twenty-five days.	
61	Margary.	Sept. 29.	36.	F.	Epithel.	Larynx, one ring of trachea, pharynx and oesoph.		Recurrence third month.
62	Gustenbauer.	Oct.	62.	M.	Carcinoma.	Total extirpation.	Cured fourteen months after.	

TABLE Continued.

No.	Operator.	Date.	Age.	Sex.	Disease.	Parts Removed.	Result.	Remarks.
63	Gussenbauer.	Oct.	63	M.	Carcinoma.	Total extirpation.	Cured six months after.	
64	C. Reyher.	Oct. 10.	73	M.	Carcinoma.	Larynx and three rings of trachea.	Death nine months after.	Recurrence.
65	C. Reyher.	Oct. 10.	65	M.	Carcinoma.	Total extirpation.	Death in seven days.	
66	Novaro.	1881.	63	M.	Carcinoma.	Total extirpation.	Death in eleven hours.	Hæmorrhage, recurrence.
67	Schede, Hamburg.	1881.	54	M.	Carcinoma.	Total extirpation.	Cured two months after.	
68	Kuster, Berlin.	1881.	?	?	Sarcoma of vocal cord.	Unil. extirpation.	Cured Apr., 1884.	
69	Novaro.	Jan. 9, 1882.	65	M.	Carcinoma.	Total extirpation.	Cured June 8.	
70	C. Keyher.	Apr. 7.	55	M.	Epithel.	Lar. and phar.	Death in fourteen days after.	Exhaustion.
71	Kocher.	May 13.	54	M.	Carcinoma.	Larynx.	Recurrence seven mos. after.	
72	Whitehead, Manchester.	May 27.	46	M.	Epithel of right cord	Larynx and two rings of trachea.	Cured Jan. 31, '83.	
73	Hergmann, Würzburg.	June 12.	54	M.	Adeno-sarcoma.	Total extirpation.	Death Feb., '83.	Recurrence.

74	Burow, Königsberg.	July 25.	45	M.	Carcinoma.	Total extirp.	Death Nov. 15, 1882.	Sudden suffocation.
75	Maydl, Vienna.	Aug. 31.	50	M.	Carcinoma.	Lar. exc. cricoid.	Cured two years after.	
76	Kocher.	Sept. 28.	43	M.	Carcinoma.	Total extirp.	?	
77	Rugli.	1882.	10	M.	Polyp. of larynx.	Total extirp.	Cured.	
78	Schede, Hamburg.	Nov. 1-1882.	?	M.	Polyp. of larynx.	Partial extirp.	Cured April, 1884.	
79	McLeod, Calcutta.	Nov. 5, 1882.	35	M.	Tumour fungating front of neck and raucous voice.	Lar. and thyroid gland.	Death 5½ months after.	Pulm. tuberculosis.
80	Hahn.	1883.	54	M.	Carcinoma.	Partial extirp.	Cured April, 1884.	
81	Lucke.	July 28.	54	F.	Carcinoma.	Total extirp.	Cured.	
82	Hodgen.		?			Total extirp.	Death in 4 days.	
83	Leisrink.	Aug. 8.	72	M.		Total extirp.	Death in 4 months after.	Pneumonia.
84	McLeod.	Sept. 19.	40		Epithel.	Total extirp.	Death in 5 days.	Hæmorrhage.
85	Novaro.	Oct. 1.	54	M.	Epithel.	Total extirp.	Death 1 month after.	Pneumonia.
86	Bergman.	1883.	?	M.	Carcinoma.	Total extirp.	Death in 4 days.	Pneumonia.

TABLE. Continued.

No.	Operator.	Date.	Age.	Sex.	Disease.	Parts removed.	Result.	Remarks.
87	Kuster.		?					
88			?					
89			?					
90	Holmes.		63	M.	Carcinoma, lar. and phar.	Total extirpation.	Death in forty hours.	Shock.
91	Hahn.	1884.	50	M.		Partial extirpation.	Cured April, '84.	
92	Schmidt, Gräfe, wald.	Feb. 15.	29	F.	Carcinoma.	Total extirpation.	Death in seven days.	Exhaustion.
93	Thos. Jones, Manchester.	April 26.	44	M.	Epithel.	Total extirpation.	Cured June 14	
94	Maydl.	1884.	45	M.	Carcinoma.	Total extirpation.	Death in four days.	Hæmorrhage.
95	Vretorius		?		Carcinoma.	Cartilage, cricoid and thyroid	Cured.	
96	Durante.		27		Carcinoma.			
97	Labbé, Paris.	March 22.	59	M.	Sarcoma.	Total extirpation.	Death three months after.	Pneumonia.

98	Störk.	1885.	?		Epithel.	Partial extirpation.	Cured, May.	
99	Bergman n.	1885.	46	M.	Carcinoma.	Total extirpation.	Cured six weeks after.	
100	Roswell Parli. Buffalo.	June 28.	64	M.	Carcinoma.	Total extirpation.	Cured Sept. 22, '85.	
101	Billroth.	Dec. 18.	?		Carcinoma one-half lar.	Partial extirpation.		
102	Labbé.	Feb. 19, 1886.	50	M.	Sarcoma.	Total extirpation.	Death ten days after.	Pneumonia.
103	Péan, Paris.	Feb. 27, 1886.	35	M.	Epithel.	Total extirpation, exc. epiglottis and some of post. muc. membrane.	Cured April 4.	
104	Péan, Paris.	March 6, 1886.	65	M.	Epithel.	Lar. anterior wall of oesophagus and base of epiglottis, exc. cricoid.	Death.	Pneumonia following entrance of milk in lungs from disturbance of feeding tube on first day.

The partial excisions were:

		CURES.	DEATHS.
For epitheliomas,	- - - 4	2	2
sarcomas,	- - - 1	1	0
contractions, necrosis, etc.,	- 6	2	4
unknown affections,	- - 3	3	0
Total,	- - - 14	8	6

Excision of the larynx has thus given us 32 cures and 64 deaths. Of 49 deaths following the operation for cancers, 2 succumbed on the second day (collapse, shock), 3, of which 1 was a partial excision, on the third day (collapse, pneumonia); 6 on the fourth day (collapse, pneumonia, hæmorrhage, asphyxia); 4 on the fifth day (pneumonia, pleurisy, hæmorrhage), 6 at the end of a week (pneumonia, embolism, exhaustion), 7 at the end of a fortnight (pneumonia, gangrene, phthisis, hæmorrhage), one on the twenty-fifth day (pneumonia), one at the end of a month (pneumonia), 3 in the second month (pneumonia, recurrence, slipping of the tube), one in the third month (pneumonia), 4 in the fourth month (pneumonia), 3 in the fifth, 2 in the sixth, in the seventh and in the ninth, one at the end of a year, and one lastly after two years. This one had been operated on partially for carcinoma, which returned about the sixth month. Of the 7 sarcomas operated on by total excision, one died on the seventeenth day, the second in the third month (pneumonia), the third in the seventh month (recurrence), the fourth in the eighth (pneumonia), the fifth at the end of a year (accidental pleurisy), the sixth in the fifteenth month (recurrence), and the last at the eighteenth month (pulmonary tuberculosis). Of the 7 deaths among cases of the contractions, necroses, etc., the 3 operated on by total extirpation succumbed—one on the fifth day, the second at the end of a month, and the last at the fifteenth month of marasmus, pneumonia and tuberculosis respectively. As regards the partial operations, one died on the third day, the second at the second month (diabetic slough), the third after two and one-half months (exhaustion), and the last in the eleventh month (progress of the disease). We only know of one death on the fourth day in a patient from whom the larynx was totally excised for an affection not stated (cancer or sarcoma).

The 32 cures are thus composed: Twenty-three for epitheliomas, of which 21 were total excisions and 2 partial, dating from 4 years, 2 years, 19, 18, 17, 16, 14 (2, of which one was a partial extirpation); 12 (one), 11, 8, 5, 4 and 2 months (2 cases); (in the 7 remaining epitheliomatous cases we only know the result for a few weeks); 3, for sarcomas, with two total and one partial excision—going back to six years, five years and three years (the partial); 3 for contractions, necroses, etc., of which one was total (polyp) and 2 partial (papilloma and stenosis consecutive to typhoid fever), and 3 for affections of which we do not know the nature (cancer or sarcoma). These were partial excisions—performed the one two years ago, the others only a few months.

In comparing the proportion of deaths and cures we see that for epithelioma—without regarding the five latest excisions, of which our information does not extend for more than two months, and one case, the end of which is unknown to us, there were 47 deaths and 15 cures, that is to say that cures only resulted in a quarter of the cases, if we may consider those operated on for two months to a year. A third of the patients operated on died in the first week from shock, exhaustion, pleurisy, pulmonary embolism, hæmorrhage (twice), collapse (3 times), pneumonia (11 times). In the first month there were 8 deaths—that is to say, that a fifth of the survivors succumbed—6 from pneumonia, and in the five following months the mortality was 12, from pneumonia, recurrence, etc., *i. e.*, more than a third of the remaining survivors.

The results in the sarcoma cases were more favorable, since in the seven fatal cases five patients lived from seven to eighteen months. Here cures resulted in nearly half of the cases. But of the six cases operated on for contractions, stenoses, etc., five lived for less than three months, one less than for six months, and the last less than a year.

Hence in the excisions of the larynx death has supervened before the sixth month in more than two-thirds of the cases—if we except, however, the sarcoma cases, in which only twice a similar rapidity of mortality has been noted.

In partial excision success has been obtained twice in three times,



whilst in total excision death has taken place in more than two-thirds of the cases, half of the patients not living beyond the fourth month.

*Indications.*—Total excision of the larynx appears to be indicated in the case of malignant neoplasms which, having invaded more than half of the organ, have spared the neighboring parts. Patients too advanced in age should not be operated upon. One of Hahn's patients, however, æt. 67, was cured without any accident, surviving three and one-half years after operation.

Excision is contra-indicated in all cases of benign growths, papillomas, perichondritis, or necrosis of the cartilages, and in cases where malignant tumours have invaded the neighboring tissues or organs at a distance. The operation should also be refused when the patient is the subject of a serious disease.

Partial excision is preferable to total, in so much the more that recurrence is not more frequent in the first than in the second. It must also be considered that with partial excision the patient can dispense with the canula. He can then speak with a bass pharyngeal voice, and in certain cases, even a new glottis is formed. On the one side is a vocal cord and on the other a cicatricial tissue replaces the cord, producing a laryngeal voice far superior to that of all the artificial larynges. Partial excision will be employed in all the cases of malignant growths which do not extend beyond half the larynx, in certain contractions due to a fibrous transformation of the tissues, and to hypertrophy or ossification of the cartilages, hindering the use of the ordinary methods of dilatation. But this operation should not be resorted to for the cure of simple contractions, papillomas, perichondritis and necrosis of the cartilages.

*Operative Procedure. Preliminary Tracheotomy.*—In the greater number of the cases, tracheotomy was preliminarily performed, either on account of dyspnoea, or specially in view of the excision of the larynx, as Czerny advised, or again in order to remove a laryngeal tumour without extirpating the organ itself. It has been maintained that tracheotomy performed about two weeks before the excision, permitted the patient to regain strength, that it habituates the mucous membrane of the air passages to the direct action of the air, and to

the tickling produced by the canula, that it had the advantage of fixing the trachea solidly to the integuments, and of preventing a too great sinking of the aerial tube, and a flow of blood and pus into the trachea during and after the operation. By means of it also anæsthesia can be maintained during the whole operation.

*Anæsthesia.*—Surgeons have generally anæsthetised the patients with chloroform, with the mixture of alcohol, ether and chloroform or by means of bichloride of methylene (Heine). A certain number have used, besides, subcutaneous injections of morphine. Bottini has proposed to employ ether spray on the skin, but he was incommoded by the resistance and movements of his patient, whom he had not put to sleep. If preliminary tracheotomy has not been already performed, it must be done as low down as possible, and then the plugging of the trachea must be effected.

*Plugging.*—After removing the canula and enlarging, if necessary, the tracheal opening, the canula-plug of Trendelenbourg is introduced. This is composed of a caoutchouc cylinder fixed below to an ordinary canula which carries a tube terminating above in the interior of the cylinder and below in a caoutchouc bag which allows inflation when the canula is in place. Trendelenbourg's plug, applied to the internal wall of the trachea, prevents the blood from penetrating into the air passages, while it leaves the respiration free through the tracheal canula. A clip, fixed on the india-rubber tube through which the plug is inflated, prevents the latter from contracting. It is well to have several of Trendelenbourg's canulæ at hand, in case one or other of them does not act conveniently.

This method of plugging has been recommended by Heine, Langenbeck, Bruns, Caselli, Schoenborn, etc. Billroth states that he has been rather hindered than well served by this plugging apparatus, and Bottini asserts that it has no advantage: "If the bag be distended as it must be, it may also distend the lumen of the trachea too much, and the patient can no longer bear the instrument. If, on the other hand, it be reduced in size enough to be tolerated, blood insinuates itself between the plug and the tracheal wall, thus augmenting the dangers one is trying to avoid." The complete distention of the cylinder should not be

effected until the narcosis is confirmed. In addition to the use of Trendelenbourg's canula, with the view to avoid the introduction of blood into the lungs, Caselli and Lange advise the head to be placed in a dependent position—as Rose recommended. Certain operators even, instead of plugging the trachea, content themselves with placing their patients in Rose's position. Hahn prefers to Trendelenbourg's apparatus a canula with the lower end surrounded by prepared sponge. Bottini places a piece of elastic tube in the canula, after performing preliminary tracheotomy, while Albert only introduces the india rubber tube after he has separated the trachea from the larynx—thus avoiding tracheotomy.

If Trendelenbourg's arrangement be employed, the tube of the chloroforming apparatus is passed through it. This consists of a metallic tube which is adapted on the one hand to the extremity of the tracheal canula, and on the other to a caoutchous tube, which is attached to a funnel-shaped metallic piece, closed by a piece of taffeta upon which the chloroform is poured. The metallic parts bent at a right angle can be completely rotated around the axis. By means of this tube chloroform can be given from a distance.

*Operation.*—In order to lay bare the larynx a single incision can be made along the median line of the neck, and at each extremity one or two perpendicular incisions, so as to have two lateral flaps. The median incision should commence about one centimetre above the hyoid bone and extend as far as the tracheal fistula, if possible, without arriving, however, at the superior border of the cicatrix. In making a second incision transversely across the upper end of the first, from the internal border of the right sterno-mastoid muscle to the same muscle of the other side, the T incision is obtained which Langenbeck has recommended. Bottini, moreover, makes an incision perpendicular to the lower end of the median one.

*2d Stage.* Before going further Schoenborn has advised the performance of laryngotomy, in order to view the interior of the larynx. This opinion is not shared by a great number of operators, who attempt to isolate the larynx by means of a forceps, a grooved sound and a galvano-cautery knife (Bottini). The muscular insertions are thus

detached and the lateral surfaces of the larynx denuded—avoiding with care the vessels and nerves. According to Bottini, compression of the pneumogastric might produce syncope.

*3d Stage.*—The extirpation may be effected from below upwards, following the example of Czerny, Billroth, Heine, Schoenborn, etc., or from above downwards, like Maas and Langenbeck. In the method from below upwards the larynx is drawn forwards by means of a hook, and the trachea is divided immediately below the cricoid, either with the bistoury or with the galvano-cautery (Caselli). If plugging has not been done, there must be placed immediately in the trachea, a canula prepared beforehand, or an India rubber tube, the calibre of which will completely obstruct the lumen of the air passage. The posterior wall of the larynx is then divided without wounding the œsophagus, the larynx is drawn forwards so as to isolate it from the anterior wall of the alimentary canal, as far as its superior border and then the thyro-hyoid membrane is incised. The larynx is thus removed without the epiglottis, which is excised afterwards if that be necessary.

In the method from above downwards, the thyro-hyoid and thyro-epiglottidæan ligaments are first incised, then the larynx is drawn forwards, and after having cut the lateral attachments of the larynx and œsophagus, the vocal organ is divided below the cricoid cartilage, or, better, the latter is divided with the help of Liston's forceps, so as to leave at the superior opening of the trachea a ring which will prevent retraction. It is evident that to act in this way, the cricoid must be free from the neoplasm.

For the extirpation, Bottini recommends the introduction of a sound into the trachea, to serve as a guide for the incision of the latter. After making a T incision, and opening the thyroid, Hahn advises an examination of the interior of the larynx to determine whether a total or unilateral excision should be done. In the latter case, he detaches the thyroid, and slits the cricoid which he partly removes. In the case of total extirpation, after dividing the cricoid, he plugs the cavity with gauze, detaches the soft parts of the opposite side, and separates this cartilage from the trachea, then he removes the larynx commencing from its lower part.

The removal being accomplished, the posterior wall of the pharynx and the superior opening of the trachea are exposed to view. The vessels are tied, Tredelenbourg's apparatus is replaced by a tracheal canula, or by a canula in the form of "—|—" ending above in a thick caoutchouc tube closed at the upper end on account of the abundant mucous secretion. The stopper may be afterwards removed so as to allow the patient to breathe through the mouth, the tracheal opening of the canula being closed (Bruns). An œsophageal catheter is then placed in position, and the necessary sutures are employed to bring together the edges of the wound. A phenic acid or iodoform dressing is then applied. Carbolic gauze or gauze steeped in dilute alcohol, or in a solution of chloride of zinc has also been used. Hahn has advised uniting the œsophagus to the thyroid membrance, so as to establish a provisional occlusion, permitting the patient to swallow. The sutures are removed on the fourth or fifth day.

During the first few days the patient is exclusively fed through the œsophageal catheter, but in most cases he may commence to take himself soft food, at about the fifteenth day or even on the eighth day (Billroth). From about the twentieth day the patient may habitually do without the catheter. A few days later an attempt to apply an artificial larynx may be made.

After the operation secondary hæmorrhage is to be feared, and above all pneumonia. To guard against this, it is well to employ permanent plugging of the trachea, and to cover the tracheal canula with a drainage tube of calibre equal to that of the trachea. Moreover inhalations and solutions of carbolic, and soda benzoate etc., may be used: it is not necessary that these substances be inhaled directly, it is sufficient for the inspired air to be charged with the vapours. To prevent the pus from penetrating to the mediastinum, and to avert the risk of pneumonia, it has been recommended to keep the patient's head bent back for the first six or seven days, so that the tracheal opening might be the most elevated part of the wound.

*Artificial Larynx.* In order to remedy the loss of voice, an artificial larynx is employed. The larynx of Gussenbauer is composed of two bent canulæ of hardened caoutchouc. One of them is to be in-

troduced into the trachea to allow of respiration ; the other, adapted by its lower end to the former, conducts the current of air to the back of the buccal cavity. After introducing these two canulæ, they are fixed by a ribbon around the neck ; and to them is adapted a third canula of silver, destined for the phonation. It contains a metallic tongue which is vibrated by the expired current of air. The vibrations are transmitted to the air in the upper canula, and the resulting sound is articulated in the pharyngeal and cricoid cavities. On the thickness and length of the metallic tongue depends the depth of the voice. Bruns' larynx is formed of an elastic tube, flattened and angular at the upper part which supports two India-rubber membranes touching at their free borders. These membranes vibrate, like the tongue of the preceding apparatus, when the external orifice of the tracheal canula is closed by means of a valve. Heine and Schmidt have applied the artificial larynx immediately after the operation ; other surgeons have waited three to five weeks. Leisrink has employed Gussenbauer's larynx on the twenty-second day in a patient who could not bear it, although he spoke very well with the apparatus. A silver Bruns' larynx was then applied, but although it was better borne, the patient could not speak. Leisrink therefore used a Bruns' larynx with a Gussenbauer's phonetic canula.

P. S. ABRAHAM.

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#### OSTEOCLASIS.<sup>1</sup>

A recent work by Pousson, of France, furnishes the most complete and instructive account of osteoclasia yet published. The author, a distinguished young French surgeon, has received considerable aid from Robin and other compatriots to whom the present position of osteoclasia is mainly due.

He justly remarks that it is perhaps wrong to regard osteotomy and osteoclasia as rivals. To-day both equally merit confidence, and are alike precise and safe.

<sup>1</sup>Osteoclasia, by Dr. Alfred Pousson. Illustrated. Paris. J. B. Baillière et fils 1886. Pp. 262.

The object of the first part of the monograph is to trace the history, the principles and the methods of osteoclasis.

*The General History.*—Four periods may be distinguished. The first or "period of hesitation." It dealt exclusively with mal-united fractures. According to Fabrice de Hilden, quoted by Laugier, neither Hippocrates nor Galen refer either to these or to the means of remedying them. Celsus advised, but timidly, the rupture of the callus. For many centuries this advice was repeated by scarcely any other surgeons except Oribasius, Rhazès, Avicenna, Fabricius d' Aquapendente, and Heister. They used those old machines with wonderful names, such as the "scammum" of Hippocrates and the "glosocomium" of Nymphodorus. Ambrose Paré was a type of many surgeons who shrank from osteoclasis from the fear of breaking the bone in the wrong place.

The 2d period (that of "*application raisonnée*") commences in 1699 with the excellent ease in which De La Motte (of Valognes) corrected a mal-united fracture of the femur. Purmann was the first to construct a special osteoclastic machine. It was a sort of wooden screw which pressed a pad against the projecting angle of a mal-united fracture. Bosc (of Wurtemberg) in 1782 invented and used several times an appliance like a book-binder's press. Oesterlen used Bosc's machine a good deal, and published, which Bosc did not. Oesterlen described a machine of his own, the "Dysmorphostéo-palincaste!"

The 3d period (that of "generalisation of osteoclasis and study of its procedures"). In 1848 Rizzoli invented his "machinetta ossifraga." It is worth while to mention incidentally the object of its author in contriving this machine. It was to shorten the sound leg of one of his patients and make it match a deformed limb on the other side! He called his book "A new Method of Curing Lameness (Boiterie)."

During this period osteoclasis for ankylosis of the hip became not unfrequent. Pousson mentions various French surgeons in this connection, and our readers will readily recall the names of Americans and Englishmen. But their collective efforts did far less for osteoclasis than did the labours of Deloré, of Lyons. This surgeon occupied himself chiefly with the manual "brisement forcé" for the cure of genu valgum,

Now appeared the osteoclast of M. Collin, a clever surgical instrument maker. It was brought forward by M. Terrillon. Though scientific it was not perfectly satisfactory.

4th period, that "de perfectionnement et d'application." Our author writes that MacEwen's osteotomy would have given the death blow to osteoclasts, if improvements in osteoclasts had not come to the rescue. Under the patronage of two eminent masters, M. le prof. Ollier and M. Daniel Mollière, M. Robin, a young Lyonnais surgeon, has invented "a veritably new method" of osteoclasts which, either by means of M. Robin's own instrument or of that of M. Collin modified according to new principles, has proved its merits in all kinds of suitable cases, including fractures, ankyloses, and deformities.

In the next chapter, dealing with fundamental principles, procedures and methods of osteoclasts in general, M. Pousson gives the following table:

Operation principles.	Procedures and methods.	
Vertical pressure.	{ Manual osteoclasts.	{ With the surgeon's hands alone, or helped by one or more assistants: Deloré's method.
	{ Instrumental osteoclasts.	{ Weights Pulleys, exercising traction on the summit of the angle. Purmann's Machine. Bosch's " Cesterlen's " Blasius's " Mnisonneuve's machine "Diaclaste." Rizzoli's osteoclaste. Bruns' " Maurique's " Esmarch's "
	{ Manual osteoclasts.	{ With the hands grasping the limb and trying to break it either by straightening or bending. The manœuvre by which one breaks a stick across the knee. Tillaux's method.
	{ Instrumental osteoclasts.	{ Apparatus employing the long arm of a lever. { Weights. Pulley's. Volkmann's. Collin's first apparatus. Taylor's apparatus. Apparatus using only a very short armed lever. { Robin's apparatus. Collin's 2d apparatus.
Flexion.	{ Manual osteoclasts.	{ With the surgeon's own hands or with those of one or more assistants.
	{ Instrumental osteoclasts.	{ Pulleys. Schneider-Mennel's machine. Jarvis's " Dieffenbach's " Hennequin's "
Traction (in the long axis of the limb).	{ Manual osteoclasts.	{ With the surgeon's own hands or with those of one or more assistants.
	{ Instrumental osteoclasts.	{ Pulleys. Schneider-Mennel's machine. Jarvis's " Dieffenbach's " Hennequin's "
Torsion.	{ Manual osteoclasts.	{ Larger's procedure.



Manual traction and torsion are mainly, if not solely used as adjutants of force applied in other directions.

As a type of the method of *manual vertical pressure*, is given Deloré's own account of his operation for genu valgum. The patient (anæsthetized) is placed on the edge of the bed. Beneath the external malleolus is put a cushion, which an assistant fixes firmly, in order to raise the knee above the plane of the bed. In this situation the angle of the genu valgum points directly upwards, and the surgeon presses upon it with his hands upon which he brings to bear the weight of his body, giving, at the same time, little shakes (*secousses*). Too much force must not be used. The pad beneath the outer malleolus must not be too thick, for obvious reasons. When the surgeon feels tired he gives way to an assistant, whose manœuvres he directs. The operator should proceed slowly, progressively and without being discouraged. At the end of a time varying with the resistance of the subject, he will see redressement take place. This time may be five minutes or even one-half an hour. Children of 2 or 3 years old, still actively rachitic, demand very little force. But great force is required for persons of say 18 to 20 years of age. Crackings are frequently heard during the operation.

Osteoclasis for genu valgum can be performed also by breaking the bone across the surgeon's knee, like a stick, or across the edge of the table (Tillaux's plan). The thigh is fixed by an assistant, and the leg and ankle are used as a lever by the surgeon.

It is difficult to fix the pelvis when dealing with an ankylosed hip. Terrillon has invented an instrument for this purpose. It is a kind of large double vice.

All the old instruments were, according to Poisson, difficult to manage and, moreover, did not allow the point of fracture to be exactly predetermined. Therefore Rizzoli, in 1845, invented his "*macchinetta ossifraga*." This consisted of a steel bar provided at its centre with a screw carrying at its end a metallic arc which pressed against the limb at the point where the bone was to be fractured, and remained motionless whilst the screw turned in its socket, thrusting the arc away from the steel bar. At each end of the latter were two

leather rings in which the limb was fixed. The limb being secured in these rings it was enough to turn the screw in order to press, by means of the metallic arc, against the intermediate part of the limb thus held. This instrument worked with considerable precision. Maurigue, of Madrid, substituted two screws which acted on pads pretty close together and broke the bone at a place between the two.

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[TO BE CONTINUED.]